CLAIMS:

Added A1

1. A settling chamber for separating nanoparticles from microparticles, the settling chamber having an aspect ratio of the height of the settling chamber to a width of the settling chamber, of sufficient value to allow the formation of two circulation zones of particles, one above the other, the settling chamber comprising a top section and a bottom section;

an outlet port located in the top section; and

an inlet port located in a side of the bottom section

2. The settling chamber of claim 1 wherein:

the bottom section has a first diameter;

the inlet port has a second diameter; and

the ratio of the first diameter to the second diameter is approximately 4 to 1.

3. The settling chamber of claim 1 wherein

the top section has a frustoconical shape with a cone angle of approximately 90° ; and

the outlet port is at the top of the frustoconical shape.

4. The settling chamber of claim 1 wherein:

the bottom section of the vessel includes a floor; and

the inlet port is located approximately 6 inches above the floor.

5. The settling chamber of claim 2 wherein:

the chamber has a particular height; and

the ratio of the second diameter to the height of the chamber is approximately 1 to 3.5.

6. The settling chamber of claim 2 wherein:

the outlet port has a third diameter; and

the ratio of the third diameter to the second diameter is approximately 1 to 3.

7. The settling chamber of claim 1 wherein:

the bottom and top sections are constructed about a substantially vertical axis;

the inlet port is constructed about a substantially horizontal axis; and

the axis of the inlet port is substantially perpendicular to the axis of the bottom and top sections.

8. The settling chamber of claim 1 wherein the chamber is constructed of stainless steel material.

9. The settling chamber of claim 1 wherein the inlet port is welded to the bottom section.

10. A method for separating nanoparticles in a settling chamber, the method comprised of the steps of:

providing a settling chamber including a bottom section having a first diameter, a top section with an outlet port located therein, and an inlet port having a second diameter located in a side of the bottom section ;

introducing a gas fluidized particle stream through the inlet port into the settling chamber at a given velocity;

establishing a gas stream flow pattern within the settling chamber that retards transportation of microparticles to the outlet port while facilitating transportation of nanoparticles to the outlet port; and

collecting the nanoparticles from the outlet port.

11. The method of claim 10 wherein the gas stream flow pattern is introduced into the settling chamber at a velocity of 10-1000 scfm.

12. The method of claim 10 wherein the gas stream flow pattern is introduced into the settling chamber at a velocity of 100-200 scfm.

13. The method of claim 12 further comprising the step of creating an interface between the main recirculating flow pattern and the secondary recirculating flow pattern.

14. The method of claim 10 wherein the step of establishing the gas stream flow pattern is further comprised of:

establishing a main recirculating flow pattern in the bottom section of the chamber; and establishing a secondary recirculating flow pattern sympathetic to the main flow pattern in the top section of the chamber.

15. The method of claim 10 wherein the nanoparticles are comprised of one of the following: metal oxide nanoparticles, metal nanopowders, metal nitride, mixed metal oxides or metal sulfide nanoparticles.

16. The method of claim 10 wherein the nanoparticles have a minimum particle size diameter of approximately 0.001 micron, and may exist either freely, or as clusters of up to a few microns in size.

17. The method of claim 10 wherein the nanoparticles have a maximum particle size diameter of approximately 0.5 micron, and may exist either freely, or as clusters of up to a few microns in size.

18. The method of claim 10 wherein the nanoparticle stream is introduced into the settling chamber at a velocity of at least 10- scfm for a chamber having a first diameter of 48 inches.

19. The method of claim 10 wherein the nanoparticle stream is introduced into the settling chamber at a velocity no greater than 1000- scfm for a chamber having a first diameter of 48 inches.

20. The method of claim 10 where in the ratio of the first diameter to the second diameter is 4 to 1.

21. A method for substantially separating fine particles from contaminant and coarse agglomerated particles into two size ranges, the first size range being greater than about 10 microns and the second size range being no greater than 10 microns, the method comprised of the steps of:

introducing a gas-fluidized fine particle stream into a particle classifier vessel, the vessel having an inlet port and an outlet port located above the inlet port;

circulating the gas-fluidized fine particle stream inside the classifier vessel in such a manner as to define flow patterns within the vessel which provide for physico-chemical conditions whereby particles having a size greater than about 10 microns are separated from smaller particles;

substantially separating the particles in the gas stream that are greater than about 10 microns from the smaller particles; and

passing the smaller particles through the outlet port.

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